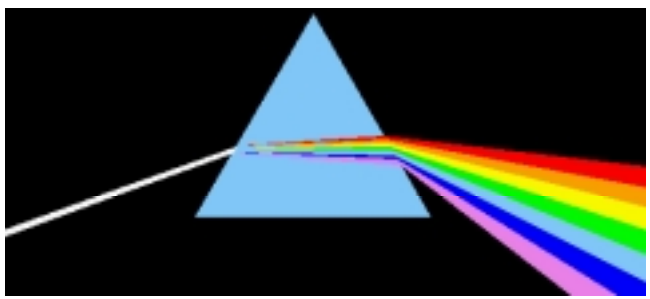
Wavelength Division Multiplexing (WDM) Technology for Naval Air Applications



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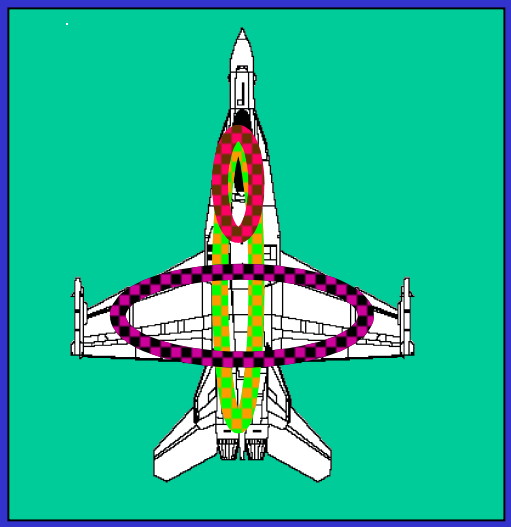
Naval Aerospace Photonics

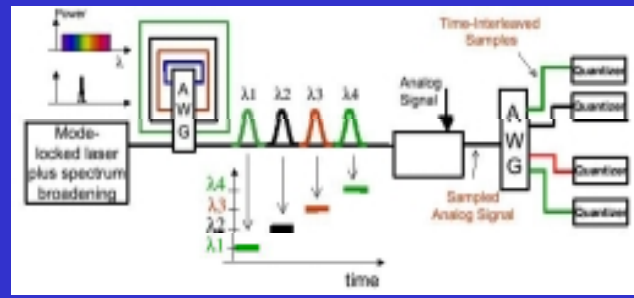
- Despite Significant Commercial and DARPA Funding of WDM Technology, the Technology Has Yet to Impact Naval Aerospace Platforms.
- Affordability, Environmental Compatibility, and Technology Readiness Level Remain Impediments.
- Directed Technology Maturation at the Component, Packaging, and System Level Are Required.
- Broad Application to Fighter, Transport, ASW, AEW, VSTOL, UAV/UCAV, Rotary Wing, and Space Platforms.
- Many Common Issues with FTTH and FTTD

Potential WDM Applications

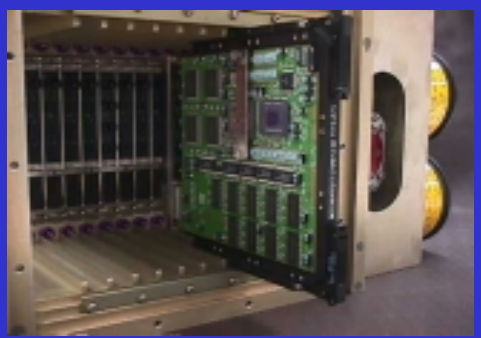


Unified Networks for Aircraft/
UCAV Avionics & VMS

Free Space Interconnects



True Time Delay/
A/D Conversion



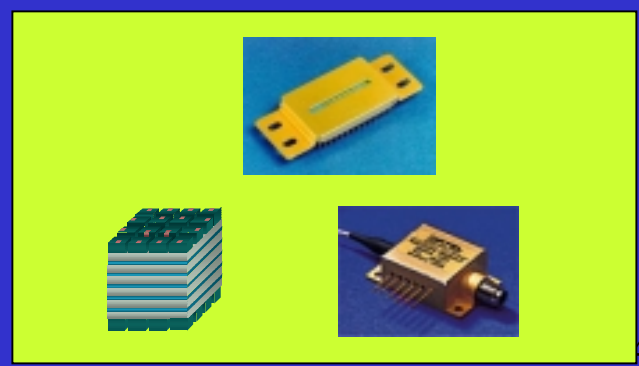
WDM Computer
Backplanes/Interconnects

Smart Skins/Structures
Interconnect and
Diagnostics

Missile and Decoy
Interfaces

Current NAVAIR WDM Developments

- FOCUS Program - Gen. 1 WDM Digital/RF Network for EA-6B and Advanced Electronic Attack (AEA) Platform (30 months)
- P-3 “Hairy Buffalo” Demonstration Sensor Integration Platform using WDM Networks (on-going)
- Broadband WDM Component Developments
- SBIR Phase II WDM RF Network (24 months)



Required Component Maturation

- **High Density Single Mode Cable Plant**
  - **Optimized Aerospace Qualified Fibers**
  - **Small Footprint Single Channel and Array Connectors**
  - **Rugged Single Channel and Ribbon Cables**

*** ONR Has Initiated a Manufacturing Technology Program for Automated Termination of Single Mode Cables**

- **λ - Tunable Connectorized Transceivers with Digital and RF capability up to 40GHz**
- **Parallel Digital Channels over single fiber via WDM for high performance computing/backplanes**

Required Component Maturation

- Small Form Factor Tunable Filters
- Connectorized Planar Wavelength Selective Couplers and Array Waveguides, Add/Drops
- Compact Linear Multi-Band/Broadband Amplifiers
- Compact Wavelength Selective "All Optical" Switching - (nsec to μsec Switching Speed)
- Embedded Structural Diagnostics
  - Bragg Grating and Fabry Perot Micro-sensors
  - Integrated WDM VMS Sensor Interface

Packaging/Connector Issues

- Aerospace Environment (Temperature, Shock, Vibration…etc) Requires Highly Integrated Devices and Components with Sealed, Connectorized, Low Profile Packages.

- Non-TE cooling preferred

- Highly Integrated WDM Transceivers Should include Built-in-Test Features
  - Power Monitors
  - Simple Logic BIT
  - Environmental Protection for Circuitry

DOD AVIATION High Speed Network Road Map

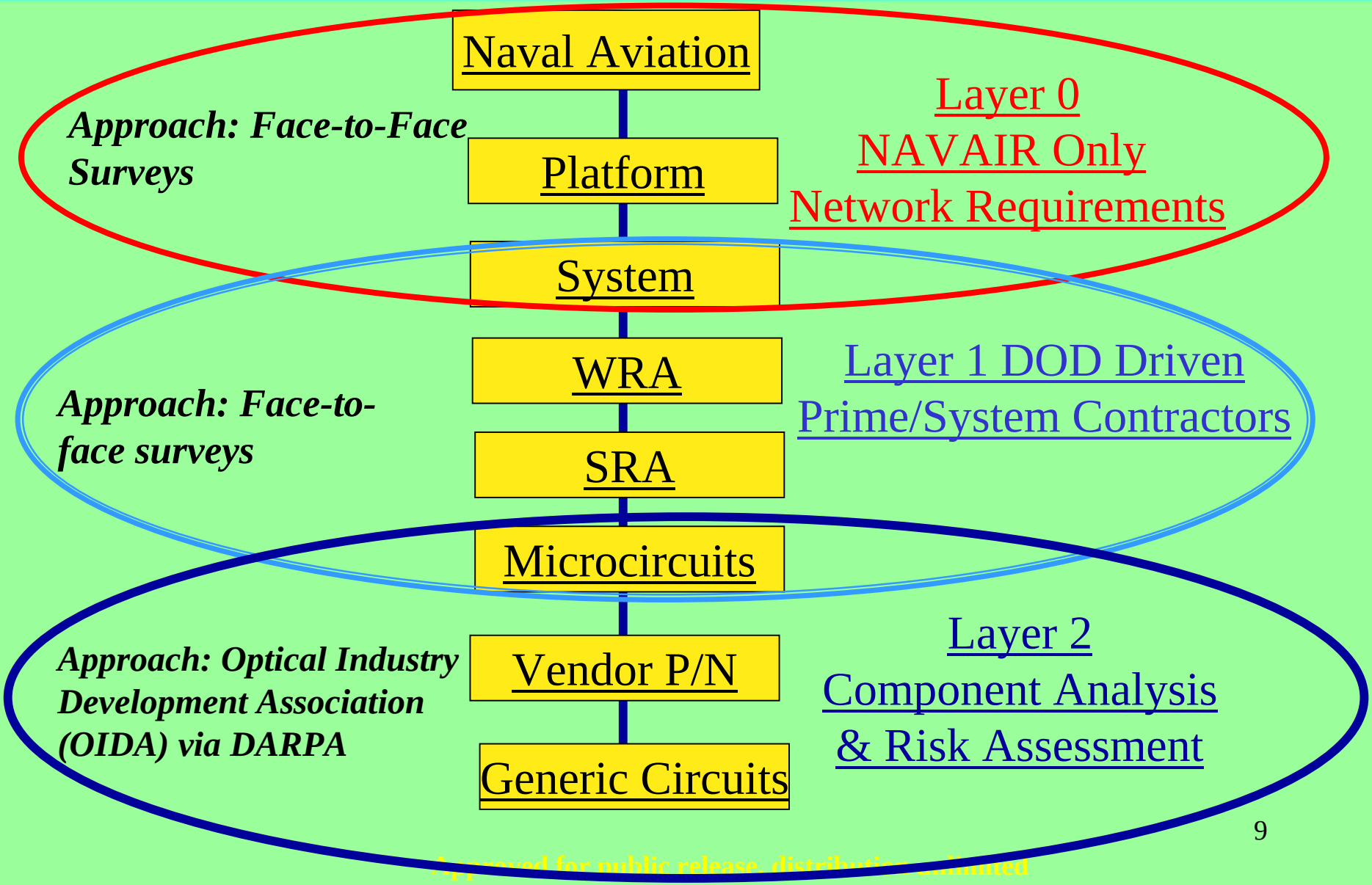
STAKE HOLDERS:

OSD (DDR&E)

US ARMY, US NAVY, USAF

DARPA

Layered Approach



Summary

- **COTS Components Must be Integrated, Packaged or Screened to Operate in this Harsh Environment**
- **Aerospace Systems Requirements are Unique and Expanding:**
  - **Latency, Determinism, Throughput, RF Frequency Bands, Fault Tolerance, System and Structural Health Monitoring.**
  - **Aerospace Environment is the Challenge**
- **Leverage Internet Driven Commercial WDM Technology**
- **Common DOD/Industry High Speed Network Roadmap in Progress for Long Term Investment Strategy**